AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated in the following listing of all claims:

1. (Currently amended) A method for detecting at least one tone having a known frequency and duration in an input signal, the input signal including a plurality of tones, the method comprising:

a. determining at least an initial frame portion and a last frame portion of the at least one tone based at least partially on the frequency and duration of the at least one tone;

b. determining an initial energy threshold detection level for the initial frame portion;

c. determining an energy value indicative of the energy of the input signal for the initial frame portion;

d. determining an energy threshold detection level for a subsequent frame portion based at least in part on the energy value of a previous frame portion;

e. determining another energy value indicative of the energy of the input signal for a subsequent frame portion;

f. comparing the energy values of the subsequent frame portion and a selected previous frame portion to determine if the at least one tone is present in the input signal; and

g. repeating (d) through (f) for subsequent frame portions until the energy value for the last frame portion is compared to the energy value for a previous frame portion.

2. (Original) The method, as recited in claim 1, wherein the initial energy threshold detection level is based on a minimum expected energy level.

3. (Original) The method, as recited in claim 1, wherein the signal is input in the time domain and (b) further comprises determining a frequency domain representation of the signal utilizing a discrete Fourier transform.

4. (Original) The method, as recited in claim 3, wherein the discrete Fourier transform is the Goertzel algorithm.

5. (Original) The method, as recited in claim 1, wherein (b) further comprises filtering the input signal to substantially remove the at least one tone from the input signal.

6. (Original) The method, as recited in claim 5, wherein (b) further comprises determining an average value of the filtered input signal for each frame portion and determining a peak value substantially indicative of the maximum average value for each frame portion.

7. (Original) The method, as recited in claim 6, wherein (b) further comprises setting a noise indicator when the peak value of the filtered input signal is greater than a noise threshold value.

8. (Original) The method, as recited in claim 1, wherein (f) further comprises allowing a drop in energy level in one frame portion by using a different previous frame portion if the energy value of the selected previous frame portion is below the energy threshold detection level.

9. (Original) The method, as recited in claim 1, wherein (f) further comprises determining when the energy values between the frame portions are within a predetermined range.

10. (Original) The method, as recited in claim 1, wherein (f) further comprises normalizing the energy levels between the at least two frames based on the number of samples in each of the at least two frames before comparing the energy levels.

11. (Currently amended) An apparatus for detecting at least one tone having a known frequency and duration in an input signal, the input signal being input over a period of time, the period of time being divided into frame portions including at least an initial frame portion and a last frame portion, the apparatus comprising:

a transform determiner coupled to receive at least the input signal and which outputs at least an energy signal indicative of the energy of the input signal;

a signal filter coupled to receive at least the energy signal from the transform determiner and which outputs at least a noise indicator based at least in part on the energy signal;

a threshold determiner coupled to receive at least the energy signal from the transform determiner and which outputs at least an energy threshold for each frame portion based at least in part on a value of the energy signal during a previous frame portion; and

a signal processor coupled to receive at least the energy threshold, the noise indicator, and the energy signal and which outputs at least a signal indicating when the input signal includes the at least one tone based at least in part on at least the energy threshold, the noise indicator and the energy signal.

12. (Currently amended) The apparatus, as recited in claim 11, wherein the energy threshold for the initial frame portion is based at least in part on a minimum expected value of the energy signal for a subsequent frame portion, and the energy thresholds for frame portions subsequent to the initial frame portion are based at least in part on values of the energy signals during previous frame portions and whether noise is detected in the input signal.

13. (Original) The apparatus, as recited in claim 11, wherein the transform determiner utilizes a discrete Fourier transform.

14. (Currently amended) The apparatus, as recited in claim 11, wherein the signal filter generates a remaining portion of the energy signal by separating a portion of the energy signal associated with the tone from the energy signal, and sets the noise indicator based at least in part on the remaining portion of the input energy signal being above a noise threshold.

15. (Original) The apparatus, as recited in claim 11, wherein the signal filter includes a low pass filter for separating the portion of the energy signal associated with the tone from the remaining portion of the energy signal.

16. (Original) The apparatus, as recited in claim 11, wherein the signal filter further includes a signal averaging filter for determining an average value of the remaining portion of the energy signal.

17. (Original) The apparatus, as recited in claim 11, wherein the signal filter further includes a peak detector for determining the maximum average value.

18. (Original) The apparatus, as recited in claim 11, wherein the signal processor compares the energy levels for the tone between at least two frame portions.

19. (Original) The apparatus, as recited in claim 18, wherein the signal processor allows a drop in energy level in one frame portion.

20. (Original) The apparatus, as recited in claim 19, wherein the signal processor determines when the energy levels of the tone between the at least two frames are within a predetermined range.

21. (Currently amended) The apparatus, as recited in claim 20, wherein the signal processor normalizes the energy levels between the at least two frames based at least in part on the number of samples in each of the at least two frames before comparing the energy levels.

22. (Original) A method comprising:

comparing an energy value for an individual frame of a plurality of frames of an input signal to an energy value of a corresponding previous frame;

generating an energy threshold detection value for the individual frame based at least in part on the comparison, a noise component of the individual frame, and occurrence of energy dropout in a corresponding preceding frame; and

detecting, based at least in part on the energy threshold detection value, at least a first tone in the input signal including a plurality of tones, the first tone having a predetermined frequency and predetermined duration.

23. (Original) The method, as recited in claim 22, further comprising:

adjusting the energy threshold detection value based at least in part on an energy value of a corresponding preceding frame.

24. (Original) The method, as recited in claim 22, further comprising:

adjusting the energy threshold detection value based at least in part on presence of speech in the individual frame.

25. (Original) The method, as recited in claim 22, further comprising:
adjusting the energy threshold detection value based at least in part on an occurrence of energy dropout in a corresponding preceding frame.

26. (Original) The method, as recited in claim 22, further comprising:
generating an energy threshold detection value for the individual frame based at least in part on a position of the individual frame in a sequence including the plurality of frames.

27. (Original) The method, as recited in claim 26, wherein the position is one of an initial frame and a final frame.

28. (Original) The method, as recited in claim 22, wherein the generating is based at least in part on a data table including scaling coefficients and addresses of energy values for at least one frame.

29. (Original) The method, as recited in claim 22, wherein the generating is based at least in part on a control word including control flags, the control flags being set based at least in part on energy values below a threshold value in a corresponding previous frame and the presence of noise in corresponding previous frames.

30. (Original) The method, as recited in claim 22, wherein a number of frames is based at least in part on sampling frequency and the predetermined duration.

31. (Original) An apparatus comprising:
means for comparing an energy value for an individual frame of a plurality of frames of an input signal to an energy value of a corresponding previous frame;

means for generating an energy threshold detection value for the individual frame based at least in part on the comparison, a noise component of the individual frame and occurrence of energy dropout in a corresponding preceding frame; and

means for detecting at least a first tone in the input signal including a plurality of tones, the first tone having a predetermined frequency and predetermined duration, based at least in part on the energy threshold detection value.